

## CLAIMS

What is claimed is:

- 1           1. An apparatus for decoding data comprising:  
2           an array of storage elements having N rows and M columns, wherein an  
3           input of each element in each column may receive data from R elements of a  
4           previous column and an output of each element in each column may be received  
5           by R elements in a next column, and  
6           wherein said inputs and outputs are logically interconnected according to  
7           an encoder polynomial for an error correction code.
- 1           2. The apparatus as in claim 1 wherein said encoder polynomial is a  
2           Viterbi encoder polynomial.
- 1           3. The apparatus as in claim 1 wherein R=2 for an encoder polynomial  
2           rate of 1/2.
- 1           4. The apparatus as in claim 1 wherein R=3 for an encoder polynomial  
2           rate of 1/3.
- 1           5. The apparatus as in claim 2 wherein M is equivalent to the depth of a  
2           Viterbi trellis.
- 1           6. The apparatus as in claim 5 wherein M = 64.

1           7. The apparatus as in claim 1 further comprising:  
2           selection signals for selecting data for each element in each column from  
3           said R elements of a previous column, said selection signals generated based on  
4           a minimum path metric associated with each storage element.

1           8. The apparatus as in claim 7 wherein N selection signals select data  
2           for elements in each of said N rows in said matrix, thereby specifying for all M  
3           elements in each row which of said R elements from a previous column to select  
4           data, said selections causing data to propagate through said matrix according to  
5           said encoder polynomial.

1           9. The apparatus as in claim 8 wherein said selection signals are  
2           generated by add-compare-select units selecting the lowest of R potential path  
3           metrics.

1           10. The apparatus as in claim 9 wherein  $R = 2$  for a code rate of  $1/2$ .

1           11. The apparatus as in claim 1 further comprising minimization logic to  
2           identify a storage element in a final column of said matrix from which to select  
3           data.

1           12. The apparatus as in claim 11 wherein said minimization logic  
2           identifies said storage element based on said storage element having a  
3           minimum path metric associated therewith.

1           13. The apparatus as in claim 12 wherein said minimum path metric is  
2 determined based on a minimum of N accumulator values of add-compare-select  
3 units associated with each of said N rows.

1           14. A forward-tracing array for decoding data comprising:  
2 a matrix of storage elements having N rows and M columns;  
3 connection logic for interconnecting said storage elements across  
4 columns according to an encoder polynomial such that each element may  
5 receive data from R storage elements in a previous column; and  
6 selection logic for selecting storage elements from said R storage  
7 elements from which to read data based on a calculated path metric associated  
8 with each of said R storage elements.

1           15. The apparatus as in claim 14 wherein said encoder polynomial is a  
2 Viterbi encoder polynomial.

1           16. The apparatus as in claim 14 wherein R=2 for an encoder polynomial  
2 rate of 1/2.

1           17. The apparatus as in claim 14 wherein R=3 for an encoder polynomial  
2 rate of 1/3.

1           18. The apparatus as in claim 15 wherein M is equivalent to the depth of  
2 a Viterbi trellis.

1           19. The apparatus as in claim 18 wherein M = 64.

1           20. The apparatus as in claim 14 wherein said selection logic further  
2 comprises:

3           N selection signals to select data for M elements in each of said N rows in  
4 said matrix, thereby specifying for all M elements in each row which of said R  
5 elements from a previous column to select data, said selections causing data to  
6 propagate through said matrix according to said encoder polynomial.

1           21. The apparatus as in claim 20 wherein storage elements in a first  
2 column of said matrix are loaded with constant values and said selection signals  
3 select data for M-1 elements in each of said N rows.

1           22. The apparatus as in claim 21 wherein said selection signals are  
2 generated by add-compare-select units selecting the lowest of R potential path  
3 metrics.

1           23. The apparatus as in claim 22 wherein  $R = 2$  for a code rate of  $1/2$ .

1           24. The apparatus as in claim 14 further comprising minimization logic to  
2 identify a storage element in a final column of said matrix from which to select  
3 data.

1           25. The apparatus as in claim 24 wherein said minimization logic  
2 identifies said storage element based on said storage element having a  
3 minimum path metric associated therewith.

1           26. The apparatus as in claim 25 wherein said minimum path metric is  
2 determined based on a minimum of N accumulator values of add-compare-select  
3 units associated with each of said N rows.

1           27. A machine-readable medium having code stored thereon which  
2 defines an integrated circuit (IC), said IC comprising:  
3           an array of storage elements having N rows and M columns, wherein an  
4 input of each element in each column may receive data from R elements of a  
5 previous column and an output of each element in each column may be received  
6 by R elements in a next column, and  
7           wherein said inputs and outputs are logically interconnected according to  
8 an encoder polynomial for an error correction code.

1           28. The machine-readable medium as in claim 27 wherein said encoder  
2 polynomial is a Viterbi encoder polynomial.

1           29. The machine-readable medium as in claim 27 wherein R=2 for an  
2 encoder polynomial rate of 1/2.

1           30. The machine-readable medium as in claim 27 wherein R=3 for an  
2 encoder polynomial rate of 1/3.

1           31. The machine-readable medium as in claim 28 wherein M is equivalent  
2 to the depth of a Viterbi trellis.

1           32. The machine-readable medium as in claim 31 wherein M = 64.

1           33. The machine-readable medium as in claim 27 further comprising:  
2           selection signals for selecting data for each element in each column from  
3           said R elements of a previous column, said selection signals generated based on  
4           a minimum path metric associated with each storage element.

1           34. The machine-readable medium as in claim 33 wherein N selection  
2           signals select data for elements in each of said N rows in said matrix, thereby  
3           specifying for all M elements in each row which of said R elements from a  
4           previous column to select data, said selections causing data to propagate  
5           through said matrix according to said encoder polynomial.

1           35. The machine-readable medium as in claim 34 wherein said selection  
2           signals are generated by add-compare-select units selecting the lowest of R  
3           potential path metrics.

1           36. The machine-readable medium as in claim 35 wherein  $R = 2$  for a  
2           code rate of  $1/2$ .

1           37. The machine-readable medium as in claim 27 further comprising  
2           minimization logic to identify a storage element in a final column of said matrix  
3           from which to select data.

1           38. The machine-readable medium as in claim 37 wherein said  
2           minimization logic identifies said storage element based on said storage element  
3           having a minimum path metric associated therewith.

1           39. The machine-readable medium as in claim 12 wherein said minimum  
2 path metric is determined based on a minimum of N accumulator values of add-  
3 compare-select units associated with each of said N rows.

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